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# DEFENSE ACQUISITIONS

## Role of Lead Systems Integrator on Future Combat Systems Program Poses Oversight Challenges



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## Why GAO Did This Study

The Army's Future Combat Systems (FCS) program features multiple new systems linked by a first-of-a-kind information network. The Army contracted with a lead systems integrator (LSI) for FCS that could serve in a more expansive role than a typical prime contractor would. In response to a congressional mandate, this report addresses (1) why the Army decided to employ an LSI for the FCS program; (2) the nature of the LSI's working relationship with the Army; and (3) how FCS contract fees, provisions, and incentives work.

In conducting its work, GAO reviewed extensive program documentation and held discussions with key officials at DOD and throughout the FCS program.

## What GAO Recommends

GAO recommends that the Secretary of Defense take steps to strengthen oversight of the FCS program and assess whether the experience of the LSI on FCS has broader implications for DOD acquisition management. DOD concurred with GAO's recommendations.

[www.gao.gov/cgi-bin/getrpt?GAO-07-380](http://www.gao.gov/cgi-bin/getrpt?GAO-07-380).

To view the full product, including the scope and methodology, click on the link above. For more information, contact Paul L. Francis at (202) 512-4841 or [francisp@gao.gov](mailto:francisp@gao.gov).

# DEFENSE ACQUISITIONS

## Role of Lead Systems Integrator on Future Combat Systems Program Poses Oversight Challenges

### What GAO Found

In 2003, the Army contracted with an LSI for FCS because of the program's ambitious goals and the Army's belief that it did not have the capacity to manage the program. The original timeframe for FCS's development was a shorter time frame than for an individual weapon system program, let alone a complex systems-of-systems program with a high number of immature technologies at program start. The Army realized that its compartmentalized workforce did not lend itself to the kind of crosscutting work that the FCS program would demand. The Army workforce also did not have the expertise needed to develop the FCS information network or enough people to support the program had it been organized into separate program offices. In contracting with the Boeing Company as LSI, the Army believed it found a management partner who could define and develop FCS and reach across the Army's organizations. Boeing subcontracted with another company, Science Applications International Corporation, to assist with its responsibilities as LSI.

The working relationship between the LSI and the Army is complex. The LSI is a traditional contractor in terms of developing a product for its customer, the Army, but also serves like a partner to the Army in management of the FCS program. In its management role, the LSI makes decisions collaboratively with the Army. An advantage of this arrangement is that the LSI and Army can maintain flexibility when dealing with shifting priorities. However, that relationship may pose significant risks to the Army's ability to provide oversight over the long term. The Office of the Secretary of Defense is in a position to provide this oversight but thus far has allowed the Army to depart significantly from best practices and the Office's own policy for weapon system acquisitions. For example, the Office of the Secretary of Defense has also allowed the Army to use its own cost estimates rather than independent—and significantly higher—cost estimates when submitting budget requests. The Army's experience with the LSI on the FCS program may provide the Office of the Secretary of Defense insights on broader acquisition management issues.

The Army has structured the FCS contract consistent with its desire to incentivize development efforts. The definitized cost-reimbursable research and development contract valued at \$17.5 billion contains up to a 15 percent total fixed/incentive fee, or about \$2.3 billion. As with many research and development contracts, the FCS contract obligates the contractor to put forth its best efforts, but does not assure successful outcomes. Assuming that critical design review is completed in 2011, the Army will have paid the LSI over 80 percent to cover the contract costs, plus a possible 80 percent of its fee or profit. GAO has previously reported that most cost growth in DOD weapon system programs occurs after critical design review. Therefore, it is possible for the LSI to have garnered most of its payouts in costs and fees early next decade, even if despite its best efforts, the FCS capability ends up falling far short of the Army's goals. The Army notes that its fee structure is intended to encourage good performance early in the program.

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## Abbreviations

CAS	Cost Accounting Standards
DFARS	Defense Federal Acquisition Regulation Supplement
DOD	Department of Defense
FAR	Federal Acquisition Regulation
FCS	Future Combat Systems
LSI	lead systems integrator
OCI	Organizational Conflict of Interest
PIA	Procurement Integrity Act
SAIC	Science Applications International Corporation
SOSCOE	System of Systems Common Operating Environment
TINA	Truth in Negotiations Act
WMI	Warfighter Machine Interface

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June 6, 2007

## Congressional Committees

With the Future Combat Systems (FCS) program, the Army is embracing a new warfighting concept by replacing most of its combat systems with a family of manned and unmanned vehicles and systems linked by an advanced information network. The warfighting concept embodied by FCS involves breaking with Army traditions and making unprecedented technological leaps. After several decades of developing systems through disconnected warfighter communities within the Army, FCS is proposed as an integrated, system-of-systems concept rather than having integration occur after systems are produced. Using this new approach, the Army intends to manage trade-offs across individual warfighter communities and weapon systems, save cost, and accelerate delivery. Recent estimates show that the total investment cost of the FCS program will be at least \$163 billion and perhaps over \$200 billion when complementary programs are included.

To achieve its goals for the FCS program, in 2003 the Army decided to employ a lead systems integrator (LSI) to assist in defining, developing, and integrating FCS. In the past few years, DOD and other agencies have applied the LSI concept in a variety of ways. In the case of the FCS program, the role of the LSI is not simply that of a traditional prime contractor, but also includes some elements of a partner to the government in ensuring the design, development and prototype implementation of the FCS network and family of systems. The pros and cons of LSI arrangements have been the subject of much debate on the FCS and other programs, such as the Coast Guard's Deepwater program. The Institute for Defense Analyses, the Army Audit Agency, and GAO have highlighted potential risks with the LSI approach on the FCS program. In light of the scope of the FCS program and its associated cost estimates, as well as concerns over the role of the LSI, Congress mandated that GAO review and report on the use of an LSI on FCS.<sup>1</sup> Our letter dated March 15, 2007 satisfied the reporting requirements for that mandate. As agreed with committee staff, this report addresses the questions from the mandate,

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<sup>1</sup>John Warner National Defense Authorization Act for Fiscal Year 2007, Pub. L. No. 109-364, § 115 (2006).

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specifically: (1) why the Army decided to employ an LSI for the FCS program; (2) the nature of the LSI's working relationship with the Army; and (3) how the contract fees, provisions, and incentives work.

In conducting our work, we reviewed extensive program documentation pertaining to the business arrangement between the Army and LSI. This included such items as the program contract and acquisition strategy. In addition, we held discussions with key officials at DOD and throughout the FCS program, including representatives from the Army, the LSI and various subcontractors. We also drew significantly on existing GAO work on weapon system acquisitions. We conducted our work from May 2006 through June 2007 in accordance with generally accepted government accountability standards. Further detail about our scope and methodology is provided in Appendix I of this report.

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## Results in Brief

The Army's decision to contract with a lead systems integrator for the FCS program was framed by two factors: (1) the ambitious goals of the FCS program and (2) the Army's capacity to manage it. As envisioned in 2003 when the program started, FCS presented a daunting technical and management challenge: the concurrent development of multiple weapon systems whose capabilities would be dependent on an information network also to be developed. All of this was to take place in about 5½ years—much faster than a single weapon system typically takes. Army leaders believed the Army did not have the workforce or flexibility to manage development of FCS on its own within desired timelines. The Army saw its limitations in meeting this challenge as (1) cultural: difficulty in crossing traditional organizational lines, (2) capability: shortage of skills in key areas, such as managing the development of a large information network, and (3) capacity: insufficient resources to staff, manage, and synchronize several separate programs. Thus, they used a contractor—a Lead Systems Integrator—with significant program management responsibilities to help it define and develop FCS and reach across traditional Army mission areas. In May 2003, the Army contracted with the Boeing Company to serve as the LSI for the FCS system development and demonstration phase. Boeing subcontracted with Science Applications International Corporation to assist in performing the LSI functions.

The relationship between the Army and the LSI is complex. On the one hand, the LSI plays the traditional role of developing a product for its customer, the Army, and on the other hand the LSI acts like a partner to the Army in ensuring the design, development and prototype implementation of the FCS network and family of systems. In forging a

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close partner-like relationship with the LSI, the Army sought to gain advantages such as maintaining flexibility to deal with shifting priorities. The Army saw this as needed because the LSI was to help define the FCS solution as well as to develop it. At the same time, this relationship, coupled with the vast scope of FCS and the synonymy of the program with the future Army, poses risks for the Army's ability to provide oversight over the long term. OSD is in a position to provide this oversight, but thus far has largely accepted the program and its changes as defined by the Army, even though it is at wide variance from the best practices embodied in OSD's own acquisition policies. In 2003, OSD approved the FCS for system development and demonstration despite the program's combination of immature technologies and short schedule and then declined to follow through on plans to make a better informed decision 18 months later. OSD has also allowed the Army to use its cost estimates rather than OSD's own independent—and significantly higher—cost estimates when submitting budget requests.

The Army has structured the FCS contract consistent with its desire to incentivize development efforts and make it financially rewarding for the LSI for making such efforts. In general, contracts are limited in that they cannot guarantee a successful outcome. This is true for the FCS contract, and specific aspects of the contract could make it even more difficult to tie the LSI's performance to the actual outcomes of the development effort. By the time the FCS critical design review is completed in 2011, the Army will have paid out over 80 percent of total costs of the LSI contract and the LSI will have had the opportunity to earn more than 80 percent of its total fee. While the Army rationally notes that it is important to use fees to encourage good performance early, the experiences of previous weapon systems shows that most cost growth occurs after the critical design review. The Army shares responsibility with the LSI for making key decisions and to some extent the Army's performance may affect the performance of the LSI. For example, the Army has to bear responsibility for the successful completion of essential complementary programs and separate technology development efforts. Accordingly, the Army has to make important judgments about what contract outcomes and changes it is responsible for versus the LSI. As with most cost-reimbursable research and development contracts, the LSI is responsible to put forth its best efforts on the development of the FCS capability. If, given that effort, the FCS capability falls short of needs, the LSI is not responsible and is still entitled to have its costs reimbursed and may still earn its full fee.

We are making several recommendations to the Secretary of Defense, including: (1) to reassess OSD's approach to overseeing the FCS program,



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including asserting its own markers for success, particularly in the areas of cost, technology maturity, design maturity, and production maturity; and (2) to assess whether the experience of the LSI on FCS has broader implications for acquisition management, such as the ability of the DOD workforce to manage a system-of-systems acquisition. In commenting on the draft of this report, DOD concurred with our recommendations. However, DOD believes that the business relationship between the Army and LSI for the FCS program is typical when compared to other major system acquisitions. We maintain our position that the scope and complexity of the FCS system-of-systems creates a business relationship that is not typical of other weapon system acquisitions. Further, DOD believed that the characterization of the requirements definition process in the report was inaccurate. We have clarified our characterization of the LSI role but maintain our position that the LSI has a significant role in the requirements definition and refinement process for the FCS program. DOD's comments are included in their entirety in Appendix III of this report.

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## Background

In May 2003, the Army and Boeing entered into an "other transaction agreement" for the system development and demonstration phase of the FCS program. Other transaction agreements are not subject to the Federal Acquisition Regulation (FAR) and this gave the Army considerable flexibility to negotiate the terms and conditions with Boeing as the LSI. The Army's rationale for using such an agreement was to encourage innovation and to use its wide latitude in tailoring business, organizational, and technical relationships to achieve the program goals. Congress raised concerns over the use of the agreement for the development of a program as large and risky as FCS, and the Secretary of the Army directed that the other transaction agreement be converted to a FAR-based contract. In March 2006, the Army definitized a FAR-based contract with Boeing for the remainder of FCS development. Science Applications International Corporation (SAIC) has a contract with Boeing to provide assistance in performing the LSI functions. All of the work performed from May 2003 through September 2005 is accounted for under the prior other transaction agreement, and all work after September 2005 is included under the new contract. Appendix II of this report provides a brief discussion of the conversion of the FCS contract from an other transaction agreement to a FAR-based contract.

The LSI as an entity is intended as a single contractor responsible for developing and integrating the FCS system of systems within a given budget and schedule. Furthermore, the LSI was intended to act throughout

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the system development and demonstration phase to optimize the FCS capability, maximize competition, ensure interoperability and maintain commonality to reduce life-cycle cost. The Army established a number of key tenets that it wanted to achieve on the FCS program, in partnership with the LSI. They include:

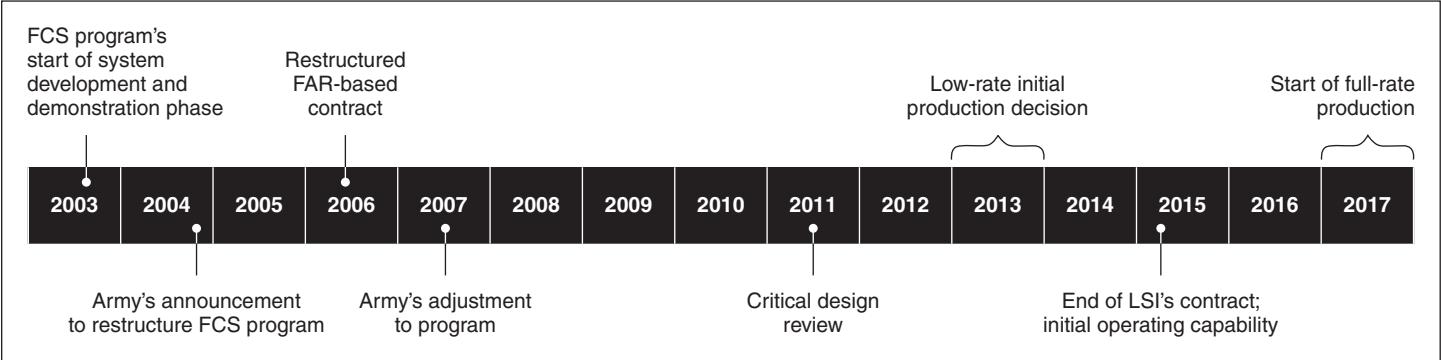
- create opportunity for best of industry to participate;
- leverage government technology base to maximum extent;
- associate ongoing enabling efforts with LSI-led activity;
- maintain a collaborative environment from design through life-cycle;
- as a minimum, achieve commonality at subsystem/component level;
- design/plan for technology integration and insertion;
- maintain and shape the industrial base for the future;
- retain competition throughout future force acquisition;
- have appropriate government involvement in procurement processes;
- achieve consistent and continuous definition of requirements;
- maintain and shape government acquisition community;
- achieve program affordability—balance performance and sustainment; and
- have a “one team” operating with partnership and teamwork.

An LSI creates an additional tier in the management structure of the FCS program that would not appear in an acquisition program for a major individual system. The Army itself does not have a direct contractual relationship with the prime-item developers as it would when buying a single system, but rather works through the LSI. This additional tier serves as a layer of separation between the customer (the Army) and the platform developers (the tier immediately below the LSI). The Army believes that this additional layer is required to bring all of the developers together to a single point of communication and interaction for the Army. The Army, LSI and platform developers are all members of the “one-team” structure of the FCS program.

The current contract between the Army and Boeing continues into fiscal year 2015 and the Army intends to begin low-rate initial production in 2013. The Army intends to start full-rate production in 2016. The Army plans to achieve initial operational capability in fiscal year 2015 and full operational capability in fiscal year 2017. The Army intends to continue FCS procurement through fiscal year 2030, eventually equipping 15 brigade combat teams—about one-third of the current active force.

Figure 1 shows the schedule of key events for the FCS program.

**Figure 1: Key Events in FCS Program's Acquisition (in Fiscal Years)**



Source: Army (data); GAO (analysis and presentation).

The Army has recently decided to make a number of key changes to the FCS program as it was considering funding plans for the fiscal 2008-2013 period. These changes include eliminating or deferring certain FCS systems, increasing quantities of some systems, reducing quantities of other systems, reducing annual procurement rates, and delaying key program milestone dates. For example, the Army deleted or deferred four systems from the FCS system of systems architecture and delayed the start of initial FCS production by five months.

## Army Decision to Use LSI Framed by Scope of Program and Workforce Limitations

The FCS program's complexity and aggressive schedule is unprecedented for the Army. As we have reported, the program was not near ready for starting the system development and demonstration phase when it did, primarily because the majority of the needed technologies were immature. The Army not only went forward with FCS, it did so with a planned schedule less than that of a single new system. The Army determined that with its existing acquisition workforce and organizations, it did not have the agility, capability, or capacity to manage the program without an LSI to assist with certain aspects of program management. In using an LSI, the Army also wanted to structure a development contract that would create incentives for the contractor to succeed and profit in development and to increase competition at lower levels in the supplier chain.

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## Concurrent Development and Integration of FCS Is Most Complex Acquisition Army Has Ever Undertaken

The sheer scope and complexity of the program was driven by the Army's desire to concurrently develop and field all systems as an integrated unit. The backbone of this unit is a ubiquitous network through which all systems of FCS will operate and communicate—a first-of-a-kind network that will also have to be developed. FCS represents a huge technological leap in system development and acquisition. Some of the major technical challenges faced in the program include:

- The 14 major weapon systems or platforms have to be designed and integrated simultaneously and within strict size and weight limitations.
- At least 46 technologies that are considered critical to achieving critical performance capabilities will need to be matured and integrated into the system of systems.
- The development, demonstration, and production of as many as 170 complementary systems and associated programs must be synchronized with FCS content and schedule. This will also involve developing about 100 network interfaces so the FCS can be interoperable with other Army and joint forces.
- An estimated 63 million lines of software code, more than 3 times the amount being developed for the Joint Strike Fighter program.

In addition to the complexity of the integration task, the Army also outlined an unprecedented timeline for FCS's development—about 5½ years—a shorter timeline than typical for a single weapon system development. We have pointed out a third source of risk, in addition to complexity and schedule, namely that the program started before it was ready for system development and demonstration because the majority of its critical technologies were immature. Mature technologies are central to having a sound business case at the start of development. Cognizant of these risks, the Army believed it could achieve its goals through use of an LSI because of the technical expertise and workforce flexibility that a private company could bring to the program. In fact, the Army wanted the LSI to help it define the FCS solution.

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## Mismatches between Scope and Pace of FCS and Capacity of Army Workforce

The Army determined it could not meet the challenges of the FCS scope and accelerated schedule with its workforce alone and with traditional management approaches. Army leadership saw its workforce as stovepiped into organizations having areas of expertise that were not a full match for what FCS needed and not large enough with the right skills to staff several separate program offices. Army leadership did not see its

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workforce as being well-suited to making the tradeoffs and integration that the FCS program demanded.

As an integrated system of systems, defining requirements and designing solutions for FCS would necessitate crossing two sets of organizational lines. The first involves the Army's traditional warfare communities, such as infantry, armor, artillery, and aviation. In the past, these communities developed their own requirements and their own weapon systems. FCS program officials noted that the Army had little success integrating such separately developed platforms because the individual communities did not coordinate their development efforts; specifically, they did not interface across communities during development to ensure systems were being designed to work with each other. A second organizational line involves the users, who develop requirements, and the developers, who manage the weapon systems. Much of the Army's previous experience with major integration efforts was problematic because of a lack of coordination between the developers and the users. Each system was developed separately and integrated into the force after the fact. The users' needs to have multiple systems integrated and working together in the field were thus not sufficiently considered in the development process. The Army believed that an LSI could achieve this more effectively than an Army program office because a contractor had greater flexibility to work across these lines.

Capability of the Army's workforce was also a factor in the decision to use an LSI. The Army's traditional areas of technical expertise, such as in armored vehicles like tanks, were not sufficient to address all the needed expertise for FCS. FCS performance is controlled to a great extent—estimated at 95 percent—by software. Current estimates put the amount of software needed at 63 million lines—the most ever for a weapon system—much of which will be needed for the information network that is the heart of FCS. The Army did not have sufficient skills in software and networks to manage this effort. Even with the LSI, the relative thinness of the Army's expertise in these areas is evident in the integrated product teams through which the Army and the LSI jointly manage the program. For example, according to an LSI program official, there are 28 LSI representatives for every Army representative on the team responsible for developing the information network. However, according to data provided by an Army official, on the manned ground vehicles team, where the Army has more expertise, there are only about 15 LSI representatives for every

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Army representative.<sup>2</sup> Service contractors separate from the LSI are counted among the Army program office representatives. Thus, the actual numbers of individuals who work for the Army directly is lower than these numbers represent.

A third factor was workforce capacity. If the FCS platforms were to be developed as separate programs, each platform would need its own workforce, meaning several separate Army program offices, each with a full complement of acquisition and technical staff. The demand for this many people would have been a challenge in light of the decline in its acquisition workforce throughout the 1990s. DOD estimates put the decline of its civilian workforce at 38 percent—much of it in acquisitions—from 1989 through 2002. Hence, the Army would not have the capacity to manage a multi-system effort like FCS with separate program offices and likely would have had to turn to contractors to fully staff the program offices.

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## Other Goals in Using an LSI on FCS

In addition to the complexity and workforce implications of FCS, the Army saw an opportunity for the LSI to give its best effort in development and to create more competition at lower supplier levels. Army leadership involved with setting up the FCS program believed that traditionally, contractors made much of their profit in production, not in research and development. Thus, the Army reasoned, the contractors are not as motivated by research and development as they are by production. Army leadership believed that by using an LSI that would not necessarily have to be retained for production, the Army could get the best effort from the contractor during the system development and demonstration phase, while at the same time making the effort profitable for the contractor.

Army leadership also set up the FCS program and contract in such a way that it would create more competition and have more influence over the selection of suppliers below the LSI. Army leadership noted that traditionally, once the Army hired a prime contractor, that contractor would bring its own supplier chains. The Army was not very involved in the choice of the suppliers. In FCS, the prime contractor—or LSI—is mainly an integrator, and the Army called for the LSI to hold a competition for the next tier of contractors. The Army had veto power over these

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<sup>2</sup>These figures exclude staff provided by “one-team” subcontractors on the integrated product teams.

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selections. In addition, the Army directed that the LSI contract with integrators at lower levels in the program and the Army has been involved with these selections. These integrators also hold competitions to select suppliers for those systems. This strategy kept the first tier of contractors (the one-team) from bringing their own supplier chains and pushed competition and Army visibility down lower in the supplier chain. It was also a means for the Army to ensure commonality of key subsystems across FCS platforms. Thus, for example, each of the manned ground vehicles would use the same sensors and engines, rather than the past practice of each vehicle having its own unique set of subsystems.

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## Close Working Relationship between Army and LSI Increases the Burden of Oversight

The relationship between the Army and the LSI is complex. On the one hand, the LSI plays the traditional role of developing a product for its customer, the Army, and on the other hand, the LSI also performs certain program management and integration responsibilities for the entire program and has a partner-like relationship with the Army. In forging a close partner-like relationship with the LSI, the Army sought to gain advantages such as maintaining flexibility to deal with shifting priorities. At the same time, this relationship, coupled with the vast scope of FCS and the synonymy of the program with the future Army, poses risks for the Army's ability to provide independent oversight over the long term. OSD is in a position to provide this oversight, but thus far has largely accepted the program and its changes as defined by the Army, even though it is at wide variance from the best practices embodied in OSD's own acquisition policies.

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## Boeing Is a Key Supplier for Critical Software

For the FCS program, Boeing serves as a traditional supplier, developing two software-intensive subsystems for the Army. Specifically, the Boeing unit that is serving as LSI is developing the System of Systems Common Operating Environment (SOSCOE). Additionally, a separate Boeing unit is developing the Warfighter Machine Interface (WMI). Both are critical to the success of FCS and, as noted by one program manager, will affect the FCS systems being developed by other contractors.

As part of the original 2003 other transaction agreement to begin system development and demonstration, the LSI was permitted to internally develop SOSCOE rather than contracting that work out to a separate supplier. This make decision was approved by the Army. Referred to in the statement of work as the "information management backbone" for FCS, SOSCOE has been likened to a computer operating system like Microsoft Windows®. All FCS systems will have to interface with this software to

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function as a single, integrated brigade combat team. Ultimately, the success of the FCS program hinges on the successful development of SOSCOE.

Boeing is also developing WMI. This work was awarded as a separate competitive subcontract by Boeing as the LSI to a separate unit within the Boeing Company under the original 2003 other transaction agreement. The software will provide a common interface for the soldiers in the brigade combat unit to receive information. The goal of this software is to provide an integrated presentation of all types of battlefield information.

Subsequent to the award of WMI, the current FCS contract for system development and demonstration was definitized with language that provides a process to mitigate potential conflicts of interest on the part of Boeing or SAIC as LSI. Under the predecessor other transaction agreement, an organizational conflict of interest clause required that certain safeguards be put in place when either a Boeing or SAIC unit wanted to compete for a subcontract. Under the current contract, an organizational conflict of interest clause is included that completely prohibits either company from competing for any work at any tier for any proposed subcontract under the FCS contract. So, although an award was made to Boeing under the predecessor other transaction agreement, any further awards are prohibited for the duration of the contract.

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### Close Working Relationship May Pose Risks

The government's relationship with a contractor—regardless if it is an LSI or a more traditional prime contractor—for a major project like a weapon system can range from a distant, arms-length relationship to a close, partner-like relationship. An arms-length relationship is characterized by separation between the government as the customer and the contractor as the supplier or developer. In this arrangement, communications between the government and the contractor are more likely to be periodic and formal. For weapon system programs, these kinds of relationships can often be found in situations in which the government can establish detailed technical specifications for the weapon system, enabling the contractor to design and develop a weapon system to meet the specifications without much government involvement. An arms-length relationship optimizes the independence of the government by minimizing the interaction between its staff and that of the contractor. The downside of this type of relationship is that information can flow slowly between the two parties, and decision-making can be sequential and untimely. For example, if the government were to wait 6 or more months between



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program reviews, work done in the interim could go astray from the government's wishes and have to be redone.

In a partner-like relationship, the government and the contractor work together on a continual basis to decide what work is to be done. Over the past 10 years, DOD has attempted to employ more partner-like arrangements on its programs. For example, in the 1990s, DOD program offices began employing integrated product teams, which are multidisciplinary teams that have the cross-functional talent from both the government and the contractor to make more informed decisions about a product's design, production, and support.<sup>3</sup> In addition, DOD has attempted to increase its use of performance-based contracting, in which agencies contract for results rather than processes and leave the determination of how best to achieve the results to the contractor. DOD guidance on performance-based contracting states that a positive relationship between the government and the contractor is essential to that kind of arrangement. For example, the guidance notes that the government and industry should work together as a team to communicate expectations, agree on common goals, and identify and address problems early on to achieve desirable outcomes. Such a partner-like relationship is intended to enable more real-time, better informed decisions, reduce rework, and provide increased flexibility to adjust to new demands.

A partner-like relationship can also pose risks for the government. Depending on the closeness of the working relationship, the government can become increasingly vested in the results of shared decisions and runs the risk of being less able to provide oversight compared with an arms-length relationship, especially when the government is disadvantaged in terms of workforce and skills. In the case of FCS, the partner-like relationship between the Army and the LSI breaks new ground and as such these risks are present. More specifically, in FCS the Army is more involved in the selection of subcontractors than we have seen on other programs, which can, over time, make the Army somewhat responsible for the LSI's subcontracting network. On the other hand, the LSI is more involved with influencing the requirements, defining the solution, and testing that solution than we have seen on other programs. This is not to say that the level of involvement or collaboration between the Army and

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<sup>3</sup>GAO, *Best Practices: DOD Teaming Practices Not Achieving Potential Results*, [GAO-01-510](#) (Washington, D.C.: April 10, 2001).

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the LSI is inherently improper, but that it may have unintended consequences for oversight over the long term.

The degree of the Army's collaboration with the LSI in the FCS program and the possible risks this poses can be illustrated in the following areas:

*Requirements.* The Army initially established the operational requirements for FCS. Based on those requirements, the Army and LSI are collaboratively refining the FCS system of systems requirements and system-level requirements (or system specifications). This refinement process has also resulted in changes and clarifications to the FCS operational requirements. The collaboration allows both parties to agree on and refine requirements that they believe are feasible based on system-of-systems requirements analysis conducted by the LSI and its subcontractors. Subsequently, the Army and LSI can reach agreement on what requirements are appropriate to achieve the FCS capability within cost and schedule goals. For example, the Army and LSI recently collaborated on the feasibility of the manned ground vehicle weight requirement. As a result of this collaboration, the Army decided to trade off the original air transport requirement that FCS manned ground vehicles weigh no more than 24 tons because they did not have enough armor to meet the survivability requirement. The Army and LSI again collaborated with the Army ultimately deciding that the requirement for vehicle weight be allowed to grow to as much as 29 tons to provide the needed armor. This change was significant, because the FCS vehicles will now have to be transported by a larger aircraft, the C-17, rather than by the C-130 transporter. Part of the reason for the change was that, according to program officials, an advanced armor being developed by the Army did not prove as effective as expected within desired weight parameters. There are several other key technologies that are still immature, and to the extent they do not perform as expected, requirements could continue to be changed to match what is technically possible. This could help ensure that FCS development can continue but may produce less value in terms of capability for the investment.

*Subcontract Selections.* The Army and the LSI collaborate on subcontract selection decisions in contracting tiers below the prime contractor level. Subcontract selections at these levels have normally been made by the contractors without much government involvement. Army officials participated in the selection process for the one team subcontracts

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awarded by the LSI to build and integrate major platforms.<sup>4</sup> The Army also plays a role in the selection of lower tier subcontractors. For example, the Army participated in the selection of a subcontractor to build the Active Protection System to protect vehicles from rocket propelled grenades. This is a fourth-tier subcontractor. Although the Army is involved with the selections, the subcontracts are awarded by the LSI or other lower-tier contractors, so traditional government bid protest remedies are not available to the losing contractors, as with any procurement between private entities.<sup>5</sup> To the extent that a subcontractor selected with the Army's involvement underperforms, the Army may bear some responsibility for the long term consequences of that performance.

*Test and Evaluation.* The LSI has a lead role in developmental testing and verification of technical requirements throughout FCS development. For the FCS program, testing and evaluation of system prototypes will be managed through a combined test organization co-led by the LSI and the Army and made of up representatives of the LSI, Army Test and Evaluation Command and the Army's FCS program management office. In its role co-leading the test organization, the LSI will coordinate and perform a number of activities to ensure FCS performance is effectively and efficiently achieved. Building and testing prototypes is funded through the LSI contract, and the LSI will recommend how many and what type prototypes will be fabricated. Typically, the Army test command conducts and/or monitors system development tests and conducts operational tests of systems to provide an objective, performance-based evaluation of system capabilities against expectations in weapons programs. Their independent role is an important source of information on how well a program is progressing. In the FCS situation, the Army test command is in the position of relying on the LSI to plan for and conduct sufficient developmental testing—as well as proper corrective actions for identified issues—which is an important precursor to a successful operational test program. This has led to concerns by members of the Army test community about their ability to conduct sufficient independent testing,

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<sup>4</sup>The Defense Contract Management Agency is also involved in most FCS subcontractor selections.

<sup>5</sup>Traditional government bid protest remedies allow contractors to protest decisions made by federal government agencies with regard to contract awards. Under bid protest provisions, such disputes can be submitted to the Comptroller General of the United States for resolution within 100 days.

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while having to work so closely with the LSI. It also raises the question of whether the LSI is too involved with testing its own solution.

*Involvement in Production.* According to the FCS program manager, the Army plans to contract with Boeing during fiscal year 2008 for the initial production of FCS capabilities to be spun out to the current forces and for the early production of the FCS non-line-of-sight cannon. The current LSI development contract for the core FCS systems extends almost 2 years beyond the FCS initial production decision. The Army does not expect that the initial brigades outfitted by FCS will meet the upper range of its requirements, and has made the LSI responsible for planning future FCS enhancements in the production phase. The LSI is also responsible for defining and maintaining a FCS growth strategy for integrating new technologies into brigade combat teams. This role keeps the LSI involved in the FCS program in the production phase and could make the LSI indispensable to the Army.

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## FCS Program Can Benefit from Stronger OSD Oversight

OSD is in a position to provide the arms-length oversight that can counterbalance some of the potential risks associated with the Army's level of involvement with both the FCS program and the LSI. Thus far, OSD has not played an active oversight role but rather has allowed FCS to proceed according to the Army's plans. It has passed on opportunities to assert its own positions on knowledge-based acquisition and cost estimates. In response to a statutory requirement, OSD has committed itself to a formal decision review of the program following its preliminary design review in 2009.

In August 2004, the Institute for Defense Analyses expressed concerns that the collaborative arrangement between the Army and LSI created an inherent tension between the roles of Army participants as both teammates and customer representatives. The Institute expressed the need for a corporate perspective on the FCS program on behalf of the Army, so an independent eye could be put toward cost, schedule and performance issues. This may be a difficult principle for the Army to put into practice. The FCS program is nearly synonymous with the Army's future forces and necessarily requires the commitment and involvement of Army leadership. FCS represents the bulk of the Army's investment portfolio.

Additionally, the nature of FCS being made up of several programs that are large enough to have been individual acquisitions in and of themselves, reduces the level of granularity of oversight that may have otherwise been

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exercised over those programs. Major defense acquisition programs have certain reporting requirements under law that provide information to decision-makers about those programs. The programs within FCS are not designated separately from FCS, so the reporting requirements for them are not the same as if they were separately designated. Since FCS generally meets those reporting requirements at the system-of-system level, the granularity of reporting on individual systems within FCS is less defined.

OSD can help provide the corporate perspective on FCS through its oversight role. To date, OSD has kept informed of the program and reviews the program annually. However, it held only one corporate-level decision meeting on FCS at which it approved the program to begin despite its being at odds with DOD's own standards for such program initiation. Although OSD has remained involved in the program, it has thus far largely accepted the program as defined by the Army. Specifically, in May 2003, the Under Secretary of Defense (Acquisition, Technology, and Logistics) approved the FCS program to begin the system development and demonstration phase, referred to as the milestone B decision. It is DOD policy for programs to have mature technologies at that point, and for programs to be evolutionary in nature—that is, an incremental improvement over existing capabilities. FCS was neither, as all of the program's 49 critical technologies<sup>6</sup> were immature and the program was a revolutionary departure from existing Army capabilities. Instead, the Army is following its own, lower standard for technology maturity—achievement by the critical design review in 2011—over 7 years later than called for by DOD policy.

Upon making that decision, the Under Secretary recognized the FCS program's immaturity and stated that there would be a milestone B update review 18 months later. This was to be a decision-making review for which the Under Secretary had listed several action items that the FCS program had to complete in order to continue. However, this review never occurred and the FCS program continued as originally planned. OSD has not since revisited its decision to approve the program. Since that time, program

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<sup>6</sup>Since 2006, a Critical Technology Working-Level Integrated product Team recommended that the Army remove three critical technologies from its assessment. The team concluded that these technologies did not conform to DOD's definition of critical technologies because, in its view, the technologies did not constitute a unique or novel application.

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costs and schedule have roughly doubled.<sup>7</sup> Accordingly, last year, we recommended that OSD hold a decision-level meeting. However, while OSD stated that it would have a Defense Acquisition Board review, it would not commit to making it a milestone decision review. It had not planned another decision meeting until the FCS production decision, referred to as milestone C. This would have been too late to have any material effect on the course of the program, short of cancellation which is extremely rare at that point in a program. Subsequently, Congress intervened and required that OSD hold the formal decision meeting, currently scheduled for 2009.<sup>8</sup> DOD has since proposed a serious approach to making that decision, which is encouraging from an oversight perspective.

Recognition and reporting of cost growth is another area in which OSD has deferred to the Army. The Army has recently restructured the FCS program to reduce the number of systems and reduce planned production rates to stay within expected funding levels. This will mark the second restructuring of the program in 4 years, which has seen program investment costs increase from \$77.2 billion in constant 2003 dollars to \$119.2 billion in 2005 according to Army estimates, and again to at least \$150.5 billion in 2006 according to an independent cost estimate. The Army estimates the cost of the recently restructured program to be slightly different than its 2005 estimate. The cost increases that have occurred since 2003 have largely been determined by the Army and OSD to be changes in scope, a distinction that is important for cost reporting purposes. As we have previously reported,<sup>9</sup> DOD has allowed unit cost increases associated with quantity reductions or increases in capabilities to be excluded from a determination of a Nunn-McCurdy breach.<sup>10</sup> DOD

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<sup>7</sup>Program cost comparison is between the original Army cost estimate—\$77.2 billion—at the start of system development and demonstration in 2003 and the May 2006 independent estimate—\$150.5-162.7 billion (base year 2003 dollars).

<sup>8</sup>Pub. L. No. 109-364, § 214.

<sup>9</sup>GAO, *Defense Acquisitions: Information for Congress on Performance of Major Programs Can Be More Complete, Timely and Accessible*, [GAO-05-182](#) (Washington, D.C.: March 28, 2005).

<sup>10</sup>10 U.S.C. § 2433 (requires the Secretary concerned to report to Congress when a program's acquisition unit cost increases by at least 15 percent over the current baseline estimate or increases by over 30 percent over the original baseline estimate and requiring the Secretary of Defense to carry out an assessment of the program and provide a written certification to Congress when a program's acquisition unit cost increases by at least 25 percent over the current baseline estimate or increases by 50 percent over the original baseline estimate).

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refers to these as programmatic adjustments and has concluded that nearly all of FCS' 76 percent cost increase—based solely on Army estimates—falls in this category. As a result, the Secretary of Defense has not had to carry out an assessment of the program or make a certification to Congress. Such an assessment and certification of FCS would have had value from an oversight perspective.

A recent decision not to use an independent cost estimate may have had a similar effect on cost reporting. In May 2006, the OSD Cost Analysis Improvement Group submitted an independent cost estimate that showed its estimate of FCS investment costs to be 24-43 percent higher than the Army estimate prepared by the FCS program office. OSD did not adopt this estimate. While OSD is not obligated to adopt its independent estimates, previous experience has shown these estimates to be more accurate than the typically optimistic service estimates and could have been become an additional factor to consider in a Nunn-McCurdy determination.

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## Contract Provides Incentives for Best Effort but Not Accountability for Program Outcomes

The Army has structured the FCS contract consistent with its desire to incentivize development efforts and make it financially rewarding for the LSI for making such efforts. In general, contracts are limited in that they cannot guarantee a successful outcome. This is true for the FCS contract, and specific aspects of the contract could make it even more difficult to tie the LSI's performance to the actual outcomes of the development effort. Key demonstrations of the actual capabilities of FCS systems will take place after the LSI has been able to recoup over 80 percent of its costs and had the opportunity to earn most of its fees. The Army shares responsibility with the LSI for making some key decisions and to some extent the Army's performance may affect the performance of the LSI. As with many cost-reimbursable research and development contracts, the LSI is responsible to put forth its best effort on the development of the FCS capability. If, given that effort, the FCS capability falls short of needs, the LSI is not responsible and still it is entitled to have its costs reimbursed and may earn its full fee.

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## FCS Contract Provides the LSI a High Level of Compensation

The current contract for completing FCS's system development and demonstration phase provides a relatively high level of compensation in terms of total dollars, fee, and price of labor. The definitized contract between the Army and the LSI is a cost-reimbursable contract that is valued at \$17.5 billion, comprised of \$15.2 billion in cost and up to a 15-percent fee of \$2.3 billion. The remaining costs and fees from the earlier

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other transaction agreement were separated from the current FAR-based contract that was definitized in March 2006. The current contract period, which includes both the remaining work from the other transaction agreement and the definitized action, effectively runs from September 2005 through the first quarter of fiscal year 2015. Under the FCS contract, the LSI is required to put forth its best efforts to ensure a successful system. The Army will reimburse the LSI's allowable costs and reward the contractor with profit in the form of a fixed and an incentive fee for its efforts. The fixed fee is paid annually and the incentive fee is earned incrementally based on the LSI's demonstrated achievement of established performance, cost and schedule criteria that are associated with program events.

The total fee of 15 percent (which includes the potential incentive fees) is based on the total value of the contract, as estimated at contract inception. However, the benefit to the LSI is very favorable when considering the cost of the work the LSI actually performs, versus the amount that it subcontracts out to other firms. On FCS, the LSI will actually perform about \$8.7 billion worth of the work when combining the costs under the previous other transaction agreement<sup>11</sup> and subsequent FAR-based contract. Using that as a base, the potential fee of \$2.7 billion roughly amounts to a 30 percent profit on the work the LSI actually does itself. According to an analysis conducted within the Office of the Secretary of Defense, this is a relatively high ratio of profit to value of work performed when compared with other large development programs.

As with most cost reimbursable contracts, the reimbursable costs of the prime contractor include its costs and the costs and fees of lower tier subcontractors. The prime's fee is separate from its reimbursable costs. For example, if a company is awarded a prime development contract for \$300 million, that figure includes both costs and fees of the contractor's subcontracts. The prime contractor's fees are calculated on the \$300 million cost figure included in the contract, but are not allowed to go up if the contract costs increase. Accordingly, if the prime contractor then awards a subcontract for \$100 million of costs and pays the subcontractor a fee of \$15 million, the full \$115 million paid to the subcontractor is part of the \$300 million of the prime contractor's estimated reimbursable costs.

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<sup>11</sup>The other transaction agreement had a total value of \$3.3 billion, with costs of \$2.9 billion and fee of \$0.4 billion. For the entire FCS system development and demonstration effort, the total contractual value is \$20.8 billion, made up of \$18.1 billion in cost and \$2.7 billion in fee.



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The prime contractor is entitled to be reimbursed for the full \$300 million in costs from the government plus be paid any fee it has earned. The result of the FCS LSI arrangement is an additional layer of subcontractors and associated costs. Thus, the costs and fees of all the prime item developers and their subcontractors are included in the \$15.2 billion in costs reimbursable to the LSI under its contract with the Army. The LSI's potential \$2.3 billion fee is calculated based on these costs, as with a typical prime contract.

Based on data provided by FCS program officials, the cost of LSI personnel is high relative to their government counterparts. The Army is paying the average LSI full-time equivalent about 25 percent more than the average cost of a federal employee in the senior executive service. These costs assume salary, benefits, and other costs of maintaining an employee on the program. We have recently reported that contractor personnel also cost the Missile Defense Agency about 25 percent more than their government counterparts.<sup>12</sup> However, the comparison data for missile defense personnel is based on all program personnel, not just the members of the more highly compensated senior executive service.

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### Majority of Program Fees and Costs Are Available to the LSI before FCS Systems Demonstrate Their Performance

Under the terms of the FCS contract, the LSI can earn over 80 percent of its \$2.3 billion fee by the time the program's critical design review is completed in 2011, and roughly 80 percent of contract costs will have been paid out by the Army by that point. Yet the actual demonstration of individual FCS prototypes and the system-of-systems will take place after the design review. Our work on past weapon system programs shows that most cost growth—symptomatic of problems—occurs after the critical design review.

The fee the LSI can earn under the FCS contract is divided between a fixed fee of \$1.13 billion that will be paid in annual installments and an incentive fee of \$1.14 billion that, according to a program official, can be earned on an incremental basis as the LSI accomplishes certain performance, cost and schedule criteria associated with each of nine key program events. Thus, it can earn portions of its incentive fees prior to occurrence of the event. Typically, incentive fees for weapon acquisition programs are based largely on how well the contractor achieves cost targets, but the LSI is

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<sup>12</sup>GAO, *Defense Acquisitions: Missile Defense Acquisition Strategy Generates Results but Delivers Less at a Higher Cost*, [GAO-07-387](#) (Washington, D.C.: March 15, 2007).

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eligible to receive a minimum of 50 percent of its available incentive fee based on performance criteria, not cost. Additionally, the contract provides for rolling over any unearned incentive fees to subsequent events. This means that if work under a fee event is delayed, the Army can decide to delay the associated fee as well and pay it when the work does get done. To the extent that the contractor is responsible for the delay, rollover can allow the contractor to get a second chance to recoup performance fee that it did not perform well enough to earn according to criteria at the original event, but it will not recoup the portion of the fee associated with schedule performance. A high-level program official did tell us that the Army plans to allow roll-over at only one program event, if the LSI does not earn its full fee at that event. Previous GAO work on fees highlighted the use of rollover as an indication that the fee structure for the program lacks the appropriate incentives, transparency, and accountability for an effective pay for performance system.<sup>13</sup> The nine fee events used to evaluate the performance of the LSI, along with the fixed and incentive fees that can be earned are listed in the table below.

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<sup>13</sup>GAO, *Defense Acquisitions: DOD Wastes Billions of Dollars through Poorly Structured Incentives*, [GAO-06-409T](#) (Washington, D.C.: December 19, 2005).

**Table 1: Fee events and schedule for FCS contract**

Dollars in millions

<b>Fiscal Year</b>	<b>Event</b>	<b>Incentive Fee</b>	<b>Fixed Fee</b>	<b>Total Fee</b>
2005	No Event		3.4	<b>3.4</b>
2006	In-Process Preliminary Design Review (Capability Maturity 0)	101.1	191.7	<b>292.8</b>
2007	No Event		178.0	<b>178.0</b>
2008	Engineering Maturity 1	125.2	168.0	<b>293.2</b>
2009	Preliminary Design Review (Capability Maturity 1)	255.3	160.6	<b>415.9</b>
2010	Engineering Maturity 2	145.3	148.4	<b>293.7</b>
2011	Capability Maturity 2 (Critical Design Review)	317.8	129.1	<b>446.9</b>
2012	Engineering Maturity 3	59.8	76.4	<b>136.2</b>
2013	Capability Maturity 3	96.8	51.7	<b>148.5</b>
2014	Engineering Maturity 4	22.6	22.0	<b>44.6</b>
2015	Verification Complete	19.9	4.6	<b>24.5</b>
<b>Totals</b>		<b>1,143.6</b>	<b>1,133.9</b>	<b>2,277.7</b>

Source: U.S. Army data and GAO analysis

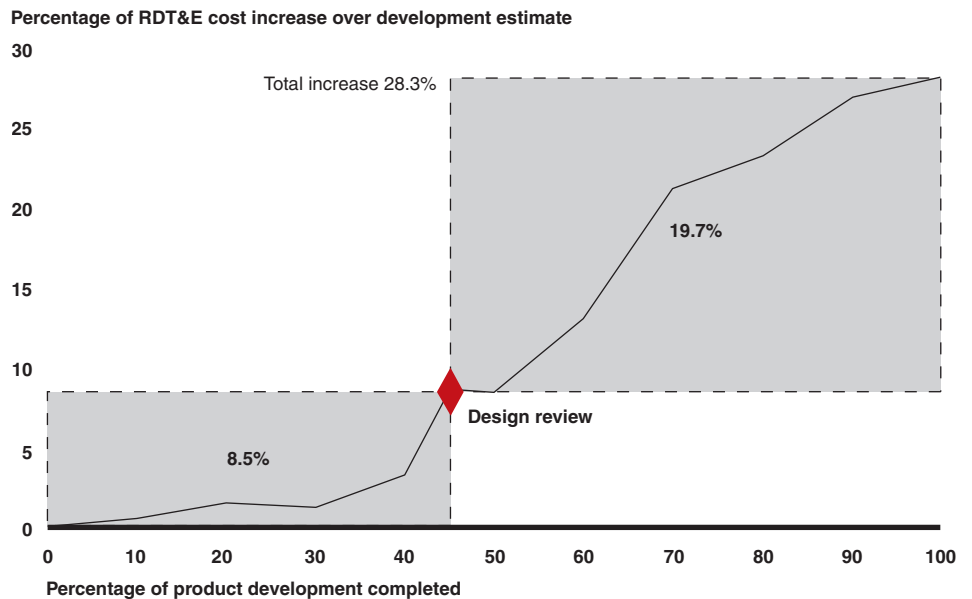
Note: Although the incentive fees are earned incrementally, the above incentive fee values are presented with each discrete event they are associated with for clarity of presentation. The above values reflect the events which occurred under the current contract, which began in September 2005. Thus, the incentive event in FY 2005, which occurred prior to that month, is not included above as it was paid under the other transaction agreement. Also, dollar amounts may not add up to totals because of rounding.

To date, the LSI has completed one incentive event under the FAR contract and received 100 percent of the available incentive fee for its efforts. By the time the Army completes the critical design review in 2011, the LSI could earn over 80 percent of its incentive fee and over 80 percent of its total fee. The critical design review is important because our work has shown that by this point in time, a weapon system's design should be stable enough to release 90 percent of engineering drawings for manufacturing. This level of knowledge is demonstrative that the design is stable and capable of meeting performance requirements. It is the point at which managers of a program can determine whether or not to build production-representative prototypes to demonstrate the actual performance of the design.

We have found that most cost growth on weapon system development programs occurs after the critical design review. As shown in figure 2,

historical information on 26 major programs that have completed development experienced about 28 percent cost growth, with almost 20 percent after critical design review.<sup>14</sup>

**Figure 2: RDT&E Percentage Increase throughout the Product Development Cycle for 29 Programs Completed or in Production**



Source: GAO analysis of DOD data.

This pattern of cost growth occurs because most programs hold critical design review before the design is stable. Subsequent building and testing of prototypes has led to the discovery of problems that are costly to fix in the late stages of development. We have already reported that the critical design review for the FCS program will occur before the program has attained a sufficient level of knowledge to ensure that technologies are mature. Moreover, the Army does not plan to build production-representative prototypes for testing, relying instead on less mature prototypes and simulations. This sequence of events sets the stage for much discovery about the FCS's actual performance and potential problems after the design review and after most of the fee can be paid to the LSI.

<sup>14</sup>For a description of the methodology behind this analysis, please see GAO, *Defense Acquisitions: Assessments of Selected Weapon Programs*, [GAO-06-391](#) (Washington, D.C.: March, 31, 2006).

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## Connecting Contract Performance with Program Performance Will be Difficult

For several reasons, it will be difficult to connect the LSI's performance on the contract with the success of the program. The contract itself, like those for other weapon system developments, does not insure the Army against an unsuccessful outcome. While the Army can gauge the progress under the contract, the LSI is responsible for providing best efforts, not successful outcomes. The criteria for fee events are not directly related to achievement of total program outcomes, and the partner-like involvement with the LSI creates a situation in which the Army's performance can affect the LSI's performance.

The FCS contract is a cost-reimbursement research and development contract. In this respect, it is no different than most contracts to develop weapon systems. Essentially, under a research and development contract, the contractor, or LSI in the case of FCS, is required to provide its best efforts at developing a capability or weapon system to the Army but is not responsible for actually producing the capability. Best efforts are measured by the inputs the contractor puts toward development of the system. Specifically, it must put the resources and processes in place to demonstrate its best efforts at developing the Army's desired capability. If the weapon systems, individually or collectively, fail to provide that capability, the LSI is not responsible as long as it has put forth best effort.

The contract fee events reflect the best effort nature of the LSI's performance and do not require the successful demonstration of specific program knowledge or outcomes. For example, the criteria for the most recent incentive fee event (which was valued at a total of about \$100 million) included such items as an updated force effectiveness analysis, the update and approval of program technical performance measures, and the completion of certain requirements and planning products. However, the incentive fee event criteria do not specify what is expected in terms of the effectiveness analysis results, the current status of the technical performance measures, or when and how the requirements process should be completed. Army program officials point out that this fee structure is meant to create incentives for the LSI to focus on putting processes in place to ensure successful development of the system. They also note that in some past programs, contracts had devoted inadequate resources to such activities. As noted in previous GAO work<sup>15</sup>

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<sup>15</sup>GAO, *NASA Procurement: Use of Award Fees for Achieving Program Outcomes Should Be Improved*, [GAO-07-58](#) (Washington, D.C.: January 17, 2007).

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and in NASA contracting guidance for major system acquisitions,<sup>16</sup> input factors such as those used as criteria for the fee events in FCS are valuable, but they do not provide indications of success relative to the desired end result of the program.

Because of its close involvement with the LSI, the Army has to make judgments about what contract outcomes and changes it is responsible for versus the LSI. The Army has already made judgments like these. When the FCS program was restructured in 2004, the cost estimate and the program schedule increased significantly as the Army changed the scope of the program by increasing requirements and adding deferred systems to the contract. The Army attributed the changes in cost and schedule to the changes in scope and took responsibility for them, absolving the LSI of responsibility. Evaluated against the revised cost and schedule estimates, the Army awarded the LSI the full incentive fee at the next program evaluation event. Such adjustments in the LSI's contractual responsibilities are possible in the future as well because the criteria for each fee event are not set until the year the event occurs and payment of fee associated with each event is done incrementally based on accomplishment of specific criteria for each event. This could allow the Army to adjust the fee criteria based on the status of the program at the time. Thus, if the LSI and Army determine that a certain segment of work due to be completed by the time of an event cannot be completed, the criteria for assessing that segment can be shifted out of that event. This occurred in the most recent program event where the scope of work associated with approximately \$105,000 in fee was shifted to the subsequent fee event. The Army and LSI decided this was necessary because accomplishment of the criteria associated with that fee was better suited for the next fiscal year.

The Army's own performance may be a factor in these decisions. For example, the Army is responsible for maturing some of the key technologies the LSI will need to integrate into the FCS systems. If these technologies do not succeed, then the expectations of the LSI may have to be adjusted accordingly. The decision to increase the weight requirement for the manned ground vehicles is illustrative. Part of the reason for the decision was the fact that an advanced, lightweight armor the Army was developing outside the FCS contract was not performing as expected. While the decision affected the vehicle design, the LSI was not responsible for development of the armor technology.

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<sup>16</sup>NASA, *Award Fee Contracting Guide* (Washington, D.C.: June 27, 2001).

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## Conclusions

Evaluating the use of the LSI on FCS involves consideration of several intertwined factors. Some, like the best efforts provisions of a cost-reimbursable research and development contract, are not unique to the LSI or to FCS. Other factors differ not so much in nature, but in degree from other programs. For example, FCS is not the first system-of-systems program DOD has proposed, but it is arguably the most complex. FCS is not the first program to proceed with immature technologies, but it has more immature technologies than any other program. FCS is not the first program to use an LSI, but the extent of the partner-like relationship between the Army and the LSI breaks new ground. Collectively, they make the LSI arrangement in the FCS context unique.

We have reported the great costs and risks DOD has accepted by committing to FCS investments. We have expressed concern that the FCS program moved forward with insufficient knowledge and, therefore, an insufficient business case. However, that aside, if one accepts the FCS program for what it is and where it is in the development cycle, the Army has set up a contractual relationship that is both consistent with its vision for FCS and candid with respect to its workforce limitations. The Army has been thoughtful about what it is trying to accomplish collaboratively with the LSI, and has been working hard to make progress, including facing up to difficult tradeoffs. On the other hand, the limits of the contractual arrangements must also be recognized. Given the unprecedented challenge FCS represents, it is unrealistic to expect that any contracting approach alone could assure a successful outcome. Ultimately, the risks of successful outcomes will be borne by the government. The contractual arrangements are not a substitute for having the high level of knowledge that a sound business case requires.

The Army has shown a high tolerance for accepting risk and responsibility on this program. In addition to accepting high technical risk, the Army has accepted responsibility for lowering the performance of some individual systems, deleting some and adding other systems, reducing quantities, and increasing costs and schedules. The Army has determined the bulk of cost and schedule changes since 2003 to be programmatic or scope-related. This determination has had two effects. First, the changes became the responsibility of the Army, entitling the LSI to earn full fee thus far. Second, the changes are excluded from a determination of a Nunn-McCurdy breach and its reporting and certification requirements. Over time, the Army runs the risk of becoming increasingly vested as it makes these and other decisions and less able to change course. Yet, the government must safeguard its ability to change course in the future as demonstrated knowledge replaces projections.

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The foregoing underscores the important role of OSD in providing oversight on the FCS program and holding the program accountable to its own policies. While the Army works to manage the program, it is important that OSD hold the program accountable to best practice standards embedded in its policies. The go/no-go decision it will hold in 2009 provides an opportunity for OSD to do so. The use of an LSI on FCS also needs to be seen as more significant than a contracting arrangement for a single program. At the very least, a proposal to use an LSI approach on any new program should be seen as a risk at the outset, not because it is conceptually flawed, but because it indicates the government may be pursuing a solution that it does not have the capacity to manage. Such solutions ought not to be accepted as inevitable or unavoidable. Instead, they require additional scrutiny before they are approved and increased oversight if they are approved.

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## Recommendations

We recommend that the Secretary of Defense:

- reassess OSD's approach to overseeing the FCS program, including asserting its own policy-based markers for progress, particularly in the areas of cost, technology maturity, design maturity, and production maturity.
- ensure that there is the best link possible between the fee events in the FCS contract and actual FCS demonstrations;
- review major FCS program changes to ensure that determinations for the government to accept changes as being programmatic or scope-related in nature are carefully scrutinized; and
- assess whether the experience of the LSI on FCS has broader implications for acquisition management, such as the ability of the DOD workforce to manage a system-of-systems acquisition.

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## Agency Comments and Our Evaluation

DOD concurred with our recommendations. DOD stated that it was updating its acquisition policy to address markers for progress in a number of areas including cost, technology maturity, design maturity, and production maturity. DOD agreed to use a variety of technical assessments to inform the Defense Acquisition Board on the FCS program's progress against its policy-based markers. It is important that the Department be as specific as possible and consistent with its own acquisition policy in setting expectations that the FCS program must meet. The Department also agreed to review the FCS award fee plan and to continue scrutinizing FCS program changes and accurately report against the program baseline. DOD noted that the FCS program scope has been expanded to add



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capability and to meet affordability constraints. In our view, some of the changes in scope were also made to correct shortcomings in the original acquisition strategy. It is important for DOD to be able to make such distinctions for reporting purposes.

In concurring that the Secretary of Defense assess whether the experience of the LSI on FCS has broader implications for acquisition management, DOD stated that its acquisition policy is being updated to better manage and control system and system-of-systems acquisitions. In addition to exploring how to improve the management of systems-of-systems and LSIs, it is important for DOD to look at the more strategic questions such as whether and under what circumstances these approaches should be taken. For example, are systems-of-systems too large a scope to manage and report as a single acquisition program? Is using an LSI preferable to getting a better match between the acquisition programs being conceived and the acquisition workforce DOD has to manage them? Should DOD be looking at reducing the scope of programs, increasing the capability of its own workforce, or both to achieve this match?

DOD also stated that it considers the business relationship for the FCS development contract to be typical of a prime contract for a major system because the FCS contractor performs a substantial portion of the development work for the program. As there is no universally accepted definition of a LSI, this distinction may be more a matter of opinion than fact. In our opinion, the role played by the FCS LSI is not typical of a DOD contractor. Two characteristics, in our view, distinguish a LSI from a traditional contractor. First, the integrator is managing across what would traditionally have been program lines, versus subsystems within a program. Second, in so managing, the integrator is acting on behalf of, and in the interests of, the government. The Army was specific about needing a different, partner-like contracting arrangement like this when it began the FCS program. We also note that while the FCS LSI is performing substantive work on software systems, its portion of total work is low relative to major prime contractors elsewhere in DOD and it is not directly involved in the development of any hardware for the FCS system-of-systems.

Finally, the Department noted that the role of the FCS prime contractor in requirements determination is not correctly framed in our draft report and that we confuse operational requirements with design specifications. We have characterized the LSI's role in this report as requirements refinement, rather than requirements definition. The requirements work being led by the FCS LSI is intended to complete the definition of the system-of-

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systems requirements and the system-level requirements. Two aspects of this role are, in our view, distinctive. First is the fact that because FCS is a system-of-systems, the functions performed are one level higher than they would have been for a typical single-system program. Thus, while the Army determines the operational requirements for the FCS brigade combat team the LSI is heavily involved with its subcontractors and the Army in setting the requirements for individual systems. On single system programs, the Army would have set the requirements for the individual system. Second, the FCS solution is being formed concurrent with the development of individual technologies and the design of systems. Thus, as the limitations of technology and design are discovered, the LSI works with the Army to change or refine the requirements to conform to these limitations. While this process is not atypical of weapon system acquisitions, the vast scope and large technical leaps sought in the FCS program requires greater involvement by the LSI in the refinement process.

DOD's comments are reprinted in Appendix III. DOD also provided technical comments, which were addressed throughout the report as appropriate.

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We are sending copies of this report to the Secretary of Defense; the Secretary of the Army; and the Director, Office of Management and Budget. Copies will also be made available to others on request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

Please contact me on (202) 512-4841 if you or your staff has any questions concerning this report. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Other contributors to this report were Assistant Director William R. Graveline, Noah B. Bleicher, Lily J. Chin, Brendan S. Culley, Michael D. O'Neill, Kenneth E. Patton, and Thomas P. Twambly.



Paul L. Francis  
Director  
Acquisition and Sourcing Management

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*List of Committees*

The Honorable Carl Levin  
Chairman  
The Honorable John McCain  
Ranking Member  
Committee on Armed Services  
United States Senate

The Honorable Daniel K. Inouye  
Chairman  
The Honorable Ted Stevens  
Ranking Member  
Subcommittee on Defense  
Committee on Appropriations  
United States Senate

The Honorable Ike Skelton  
Chairman  
The Honorable Duncan L. Hunter  
Ranking Member  
Committee on Armed Services  
House of Representatives

The Honorable John P. Murtha, Jr.  
Chairman  
The Honorable C. W. (Bill) Young  
Ranking Member  
Subcommittee on Defense  
Committee on Appropriations  
House of Representatives

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# Appendix I: Scope and Methodology

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To identify factors that led to the Army's decision to use an LSI for the FCS program and to determine the work performed by the LSI, we performed the following:

- We obtained and analyzed the program documents including the FCS system development and demonstration contract, statement of work, Army FCS acquisition strategy report, and FCS operational requirements document to gain an understanding of the terms and conditions of LSI responsibilities, the structure and processes of the program, and goals of the Army. We reviewed FCS subcontracts to understand the nature of the FCS one team and to ascertain how Federal Acquisition Regulation clauses were flowed down after FCS contract conversion. We reviewed Army audits, Defense Contract Management Agency and Defense Contract Audit Agency reports, as well as GAO reports and testimonies.
- We reviewed Army and DOD guidance as well as the Federal Acquisition Regulation to understand government contracting standards and procedures used for the acquisition of major weapon systems.
- We interviewed FCS program officials from the Tank-Automotive and Armaments Command, DOD's Office of Acquisitions, Technology, and Logistics, Defense Contract Audit Agency, and Defense Contract Management Agency to gain insight into why the Army chose and LSI business arrangement, how it is performing, and potential concerns for the future.
- We interviewed one team partner officials from 12 of the major platform development offices to receive feedback from those implementing the program decisions made by the LSI. These discussions focused on differences, benefits, and drawbacks of the LSI business approach when compared to more traditional, prime contractor arrangements. As many of these firms have extensive experience in defense contracting, we spoke about alternatives that the Army could have used for the FCS procurement. Finally, these discussions allow us to gain insight into the implementation and impact of the other transaction agreement to FAR contract conversion.

To evaluate the implications of the Army's relationship with the LSI, we performed the following:

- We reviewed and collected information from the acquisition strategy report, statement of work, the FAR-based contract, documents related to source selection decisions, the integrated master schedule and documents related to the in-process preliminary design review, and the operational requirements document to identify the roles and responsibilities of the Army and LSI.
- We interviewed key Army and LSI program managers, who were responsible for the overall FCS program, the Army and LSI leaders of the major integrated product development teams and met with selected officials from the first tier of major subcontractors to assess communication and decision making within the program.

To evaluate the Army's criteria for assessing the LSI's performance, we conducted the following:

- We reviewed the financial terms of the contract, the criteria for assessing the LSI's performance at program incentive events contained in the contract and integrated master plan and conducted quantitative analyses of the contract's fixed and incentive fees;
- We reviewed the LSI's presentations for the Army's assessment and also interviewed Army officials, who were responsible for reviewing the LSI's performance. To evaluate the program's financial reporting systems, we interviewed officials from the Defense Contract Management Agency and Defense Contract Audit Agency.

To accomplish our work, we visited and interviewed officials from the Army Tank and Automotive Command, Warren, Mich.; Army integrated product team leaders in Huntsville, Ala., Hazelwood, Mo., Fort Picatinny, N.J.; LSI officials, in Hazelwood, Mo. and Huntington Beach, Calif. In addition, we interviewed 12 one team partners across the United States. We also interviewed officials from the Defense Contract Management Agency, Defense Contract Audit Agency and the Office of the Secretary of Defense's Cost Analysis Improvement Group.

We conducted our review between May 2006 and June 2007 in accordance with generally accepted government accounting standards.

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# Appendix II: Overview of FAR Provisions Included in Future Combat Systems Lead Systems Integrator Contract

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The Federal Acquisition Regulation (FAR) provides uniform policies and procedures for acquisitions by federal government executive agencies. Depending on the type of contract entered into, different FAR clauses and provisions are used to protect the government's interests and define the terms of the agreement. Likewise, contracting officers structure a contract appropriately depending on the products or services being procured. A multitude of FAR provisions and agency FAR supplement provisions give contracting officers a wide range of options to tailor government contracts to meet the specific agency needs. While many FAR clauses are required to be incorporated in all contracts of a particular type, other provisions are only required to be included as applicable.

The Army's original FCS Other Transaction Agreement was converted into a FAR-based cost-reimbursable research and development contract in 2006. According to the Army, the new FCS contract includes the FAR and Defense Federal Acquisition Regulation Supplement (DFARS) requirements appropriate for this type of procurement. While GAO confirmed the Army's analysis of the FAR-based contractual provisions, it did not conduct an independent detailed examination of every applicable clause in the contract. However, GAO did confirm the inclusion of several FAR requirements that address areas of key concern.

- Cost Accounting Standards (CAS) – Two FAR part 12 provisions pertaining to the use and administration of CAS have been included in the FCS contract.
- Procurement Integrity Act (PIA) – The FCS contract includes the two FAR clauses required to address PIA concerns.
- Truth in Negotiations Act (TINA) – TINA standards for cost and pricing data are addressed in three FAR part 12 provisions. Additional information regarding exceptions and requirements for cost and pricing data are included separately in the FCS contract.
- Organizational Conflict of Interest (OCI) – Although the predecessor other transaction agreement contained an OCI clause that required certain safeguards be put into place if and when Boeing and SAIC competed for subcontracts, it did not preclude them from such competitions. The FCS FAR contract includes an OCI provision that precludes the Boeing/SAIC LSI team from competing for any FCS subcontract awards. Though FCS subcontractors may compete for additional FCS subcontracts, the OCI provision in the FCS contract requires that steps be taken to

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ensure an absence of any organizational conflicts of interest during subcontractor selection activities. Additionally, this clause provides instruction on how proprietary information should be protected.

# Appendix III: Comments from the Department of Defense



ACQUISITION,  
TECHNOLOGY  
AND LOGISTICS

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MAY 17 2007

Paul L. Francis  
Director, Acquisition and Sourcing Management  
U.S. Government Accountability Office  
441 G Street, N.W.  
Washington, D.C. 20548

Dear Mr. Francis:

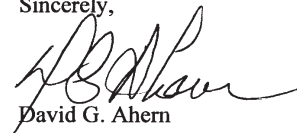
This is the Department of Defense (DoD) response to the GAO Draft Report, GAO-07-380, "DEFENSE ACQUISITIONS: Role of Lead Systems Integrator on Future Combat System Program Poses Oversight Challenges," dated April 20, 2007 (GAO Code 120555).

The report recommends the Secretary of Defense take steps to strengthen oversight of the FCS program and assess whether the experience of the LSI on FCS has broader implications for DOD acquisition management.

The Department concurs with the GAO recommendations and our comments are enclosed. Detailed technical comments were provided separately.

There are two additional points of clarification worthy of note. First, we consider the business relationship for the FCS System Development and Demonstration contract to be typical of a prime contract for a major system because the FCS prime contractor performs a substantial portion of the developmental work for the program, to include providing the System of System Common Operating Environment software. Additionally, the role of the FCS prime contractor in requirements determination is not correctly framed in this report, confusing the operational requirements in the Army's Operational Requirements Document (ORD) with design specifications that the contractor derives from those operational requirements.

Sincerely,

  
David G. Ahern  
Director  
Portfolio Systems Acquisition

Enclosure:  
As stated





GAO DRAFT REPORT - DATED APRIL 20, 2007  
GAO CODE 120555/GAO-07-380

"DEFENSE ACQUISITIONS: ROLE OF LEAD SYSTEMS INTEGRATOR ON FUTURE  
COMBAT SYSTEM PROGRAM POSES OVERSIGHT CHALLENGES"

DEPARTMENT OF DEFENSE COMMENTS  
TO THE RECOMMENDATIONS

**RECOMMENDATION 1:** The GAO recommended that the Secretary of Defense reassess OSD's approach to overseeing the Future Combat System (FCS) program, including asserting its own policy-based markers for progress, particularly in the areas of cost, technology maturity, design maturity, and production maturity. (p. 26/GAO Draft Report)

**DoD RESPONSE:** Concur. The Department's acquisition policy instruction is being updated. The modification is intended to address the Department's policy regarding markers for progress in a number of areas including cost, technology maturity, design maturity and production maturity. For the FCS program, the Defense Acquisition Board (DAB), aligned with the program's Preliminary Design Review, will receive a number of critical assessments to support the Department's FCS acquisition and budget decisions. These include a Technology Readiness Assessment to address technology maturity; an independent cost estimate to address program cost, and a System Engineering assessment to address design and production maturity. These assessments will inform the DAB on progress against the Department's policy-based markers for program progress.

**RECOMMENDATION 2:** The GAO recommended that the Secretary of Defense ensure that there is the best link possible between the fee events in the FCS contract and actual FCS demonstrations. (p. 26/GAO Draft Report)

**DoD RESPONSE:** Concur. The Director, Defense Procurement and Acquisition Policy will review the FCS award fee plan.

**RECOMMENDATION 3:** The GAO recommended that the Secretary of Defense review major FCS program changes to ensure that determinations for the government to accept changes as being programmatic or scope-related in nature are carefully scrutinized. (p. 26/GAO Draft Report)

**DoD RESPONSE:** Concur. The Department reviews program changes at least yearly in support of Selected Acquisition Report submissions. The FCS program scope has been expanded to include delivery of selected FCS capabilities to the current force, referred to as Spin-Outs. Additionally, the production timeframe was expanded due to department affordability constraints, slowing the delivery schedule for the FCS brigades. The department will continue to scrutinize FCS program changes and accurately report against the program baseline.

**RECOMMENDATION 4:** The GAO recommended that the Secretary of Defense assess whether the experience of the lead system integrator on FCS has broader implications for acquisition management, such as the ability of the DoD workforce to manage a system-of-systems acquisition. (p. 26/GAO Draft Report)

**DoD RESPONSE:** Concur. There are a number of Department activities ongoing that support this recommendation. The Defense Acquisition University (DAU) addresses system-of-system management, and systems engineering in many of its acquisition workforce training programs. DAU continually reassesses and updates its training material, case studies, and course work to reflect implications for acquisition management of things such as the FCS program experiences with system-of-system management. Additionally, an update to the acquisition policy (DoDI 5000.2) is in process and a key component is the Department's revitalization of the system engineering process to better manage and control system and system-of-system acquisitions. Furthermore, there is a Defense Federal Acquisition Regulation Supplement case that implements the limits on contractors acting as lead system integrators as included in the FY 2007 NDAA.

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